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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/596,280	06/08/2006	Yasuo Fukuda	P30037	4880

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GREENBLUM & BERNSTEIN, P.L.C.
1950 ROLAND CLARKE PLACE
RESTON, VA 20191

EXAMINER	
RAO, G NAGESH	
ART UNIT	PAPER NUMBER
1792	

NOTIFICATION DATE	DELIVERY MODE
01/23/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

gbpatent@gbpatent.com
pto@gbpatent.com

Office Action Summary	Application No.	Applicant(s)	
	10/596,280	FUKUDA ET AL.	
	Examiner	Art Unit	
	G. NAGESH RAO	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 June 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *9/20/06, 10/20/08*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1) Claims 6-7, 10, and 16-18 objected to because of the following informalities: The following aforementioned claims mention steps referring to a fourth, fifth, and sixth cleaning step with respect to the set of claims that depend from independent claim 6. However there is no mention of a first, second, and third cleaning steps in the claim language, which therefore eluding to some confusion for interpretation. Appropriate correction is required. For purposes of examination, examiner will treat the terms fourth, fifth, and sixth, as referring to a numerical sequence like that of first, second, and third, and nothing more than that point of view.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2) Claims 1, 3-4, 6, and 8-9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 refers to a second and third cleaning step for cleaning the back and top surface of the wafer respectively, but makes no clear mention what the

cleaning step entails or uses with respect to the process of cleaning. Just language alluding to the property of the wafer surface being water repellant.

Claim 6 refers to a fifth and sixth cleaning step for cleaning the back and top surface of the wafer respectively, but makes no clear mention what the cleaning step entails or uses with respect to the process of cleaning. Just language alluding to the property of the wafer back surface being water repellant and top surface being hydrophilic.

Claims 3-4 and 8-9 refer to the contact angle with respect to the surface of the wafer (be it the water repellent or hydrophilic surface), however it is not clear what the contact angle of the surface is alluding too? Is it with respect to the film deposited on the wafer thereafter or in connection to a means of contact to the surface of the wafer? Clarity on the scope and definitiveness of these claims would be greatly appreciated.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Product by Process Claims Interpretation

3) Claim(s) 11-12 is/are written in a Product by Process format, and as such the patentable weight given to the claim(s) is/are based on the limitations imparted onto the product's structural characteristics and not the processing steps of making or using said product. Please see MPEP 2113 [R-1] for further details.

4) Claims 11-12 are rejected under 35 U.S.C. 102(b) as being anticipated by Dietze (US Patent No. 6,454,852).

As such the case, claims 11-12 are directed to a Si wafer (which represents an epitaxial wafer) with an epitaxial film deposited over the substrate (i.e. wafer) (See Abstract).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5) Claims 1-2, 5, and 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dietze (US Patent No. 6,454,852) in view of Brabant (US Pg Pub 2003/0036268).

Dietze 852 pertains to the method of making an epitaxial wafer with silicon wafer including the following steps:

A first cleaning process of the wafer surfaces (which inherently means and includes the top and bottom surface of the wafer) with a SC-1 and SC-2 cleaning process aka RCA cleansing process (See Col. 9 Lines 45-50). As well thereafter the teachings of including a step of epitaxial deposition on the cleaned and polished Si substrate (See Col. 9 Lines 58-68 as well Figure 1).

However Dietze 852 does not adequately disclose subsequent cleaning processing steps that occur after the SC-1 and SC-2 cleaning process, referred to as second and third cleaning steps.

In the same field of endeavor pertaining to semiconductor processing of epitaxial wafers utilizing an RCA Process of cleansing, Brabant 268 discloses in the prior art that it is known to employ a generally optional "HF last" step by dipping the Si wafer into the hydrofluoric acid solution, which would enable the wafer to have a water repellent surface as a result of the "HF" dipping. Examiner notes that applicants have claimed steps two and three of the cleaning to employ the use of a HF or BHF solution as noted in dependent claims 5 and 13-15, which would therefore inherently enable the Si wafer to form a water repellent surface, since it results from the exposure to the HF solution. Furthermore cleaning steps

two and three are employed simultaneously and require the same solution for processing the wafer (See Sections 0010-0012).

It would be obvious to one having ordinary skill in the art at the time of the invention to employ the use of a HF solution as a subsequent cleansing step following the RCA cleansing process before growth of the epitaxial film on the Si wafer, in order to aid in preventing oxidation on the surface of the wafer by creating the hydrogen-terminated surface (i.e. water repellent). It is also obvious to notate that the second and third cleansing steps are one and the same thing, and to denote it as such rather than as a one single step is based on rationale that an extended or followup cleansing may be desired for allowing for more optimal and effective processing means of a higher quality epitaxial wafer.

6) Claims 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dietze (US Patent No. 6,454,852) in view of Tanaka (US Patent No. 6,239,045).

Dietze 852 pertains to the method of making an epitaxial wafer with silicon wafer including the following steps:

A first cleaning process of the wafer surfaces (which inherently means and includes the top and bottom surface of the wafer) with a SC-1 and SC-2 cleaning process aka RCA cleansing process (See Col. 9 Lines 45-50). As well thereafter

the teachings of including a step of epitaxial deposition on the cleaned and polished Si substrate (See Col. 9 Lines 58-68 as well Figure 1).

However Dietze 852 does not adequately disclose subsequent cleaning processing steps that occur after the SC-1 and SC-2 cleaning process, referred to as fifth and sixth cleaning steps, as well the process of allowing for one surface to be water repellent and the other surface to be hydrophilic.

In the same field of endeavor pertaining to semiconductor processing of epitaxial wafers utilizing an RCA Process of cleansing, Tanaka 045 does disclose that it is known to incorporate a variety of cleansing steps (which would encompass a fifth and sixth step after the fourth step (initial step) and able to be performed simultaneously) before and after epitaxial deposition film growth on the Si wafer utilizing not only the RCA cleansing step but also incorporating the use of a HF solution for eliminating oxide films (allowing for the creation of a water repellent surface) as well an "O_3 + Water" cleansing step allowing for a hydrophilic surface to be created (See Figures 5-6 and Col 1 Lines 55-68, Col 2 Lines 1-35, Col 4 Lines 1-44).

It would be obvious to one having ordinary skill in the art at the time of the invention to employ the use of a HF solution and a "O_3 + Water" as subsequent cleansing steps following the typical RCA cleansing process before growth of the

epitaxial film on the Si wafer, in order to aid in preventing oxidation on the surface of the wafer by creating the hydrogen-terminated surface (i.e. water repellent) as well be able to create alternatively a hydrophilic surface. It is also obvious to notate that the fifth and sixth cleansing steps are one and the same thing, and to denote it as such rather than as a one single step is based on rationale that an extended or followup cleansing may be desired for ultimately allowing for more optimal and effective processing means of a higher quality epitaxial wafer.

7) Claims 10 and 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dietze (US Patent No. 6,454,852) in view of Tanaka (US Patent No. 6,239,045) in further view of Sato (US Patent No. 6,942,737).

From the aforementioned hypothetical combination, Dietze 852 and Tanaka 045 disclose an efficient and definitive processing technique for the cleansing and fabrication of an epitaxial wafer.

However the prior art fails to disclose the use of a sponge brush in conjunction with the "O_3 + Water" solution of the sixth cleansing step directed towards one of the surfaces of the Si wafer substrate.

In the same field of endeavor pertaining to substrate cleansing and processing, Sato 737 discloses the use of a sponge brush in conjunction with a water solution in order to provide for a more efficient cleansing means (See Abstract, Col 1 Lines 8-40 and Col 5 Lines 13-30).

It would be obvious to one having ordinary skill in the art at the time of the present invention to employ the technique disclosed in Sato 737 with that of the hypothetical combination of Dietze 852 and Tanaka 045 in order to employ for a more effective and efficient cleansing means of the substrate in fast and predictable manner.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to G. NAGESH RAO whose telephone number is (571)272-2946. The examiner can normally be reached on 8:30AM-5PM (INDEPENDENT FLEX SCHEDULE).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MIKHAIL KORNNAKOV can be reached on (571)272-1303. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/G. Nagesh Rao/
Patent Examiner GAU-1792